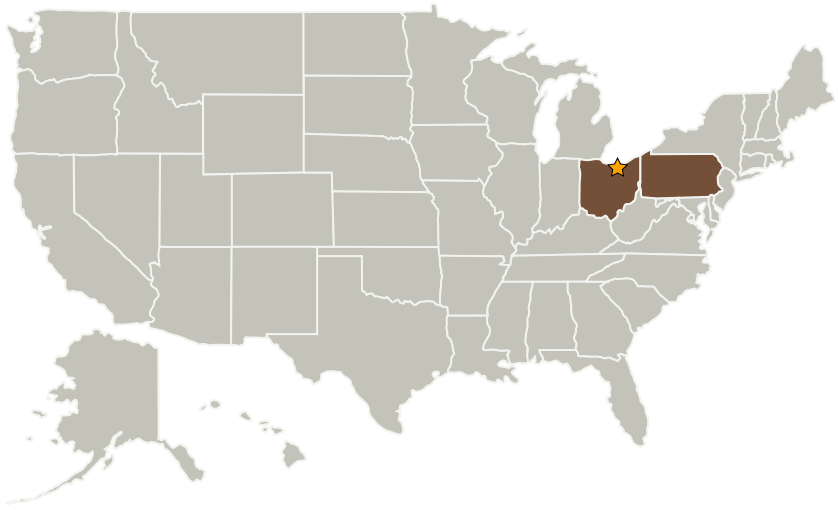
Multi-Axial Damage Index and Accumulation Model for Predicting Fatigue Life of CMC Materials, Phase I

Completed Technology Project (2008 - 2008)

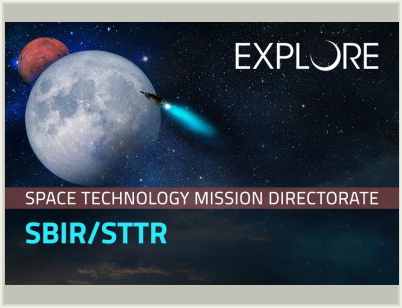
Project Introduction

The fatigue life of CMCs must be well characterized for the safe and reliable use of these materials as integrated TPS components. Existing fatigue life prediction models for composite materials may be classified into three different categories: a) fatigue life model (S-N curves), b) residual strength or residual stiffness model, and c) progressive damage model. Recently, a damage index and accumulation model has been developed by Liu and Mahadevan based on Tsai-Hill static strength failure criterion. Using this approach as a framework, MR&D is proposing to develop and verify a relatively simple and computationally manageable approach to the fatigue life prediction of fabric reinforced C/SiC composites for hypersonic vehicle load bearing thermal protection system designs. A combined experimental and analytical program is proposed to achieve the objective of the proposed Phase I effort. At the conclusion of Phase I, a TRL of 2 will have been achieved and progress towards achieving a TRL of 3 will have been made.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Materials Research and Design, Inc.	Supporting Organization	Industry	Wayne, Pennsylvania



Multi-Axial Damage Index and Accumulation Model for Predicting Fatigue Life of CMC Materials, Phase I

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Multi-Axial Damage Index and Accumulation Model for Predicting Fatigue Life of CMC Materials, Phase I

Completed Technology Project (2008 - 2008)

Primary U.S. Work Locations	
Ohio	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian J Sullivan

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.2 Computational Materials